

Mini-LED BLU

Full-scale local dimming



Korea / Headquarter

Lumens Co., Ltd.
12 Wongomae-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Korea (17086)
Tel: 031-8033-2000
Fax: 031-8033-2142

www.lumensleds.com

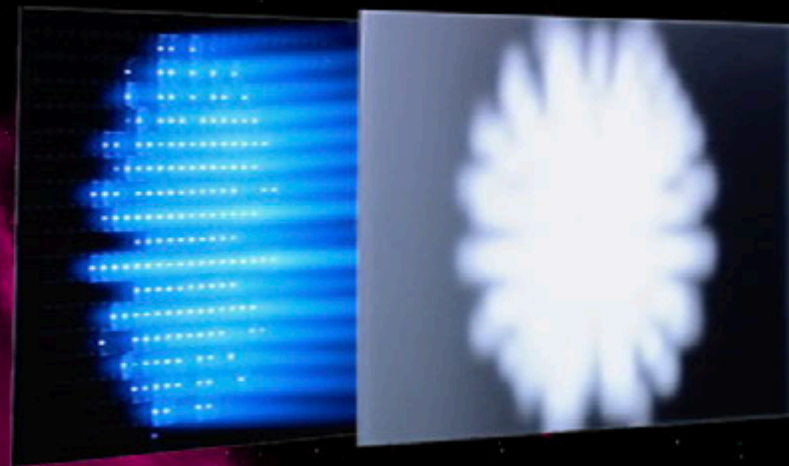
E-mail : sales01@lumens.co.kr

©Copyright August, 2021 lumens. All rights reserved. Informations may change without notice.

LUMENS

▼ Mini-LED Backlight

▼ Diffuser plate (Optic sheet)



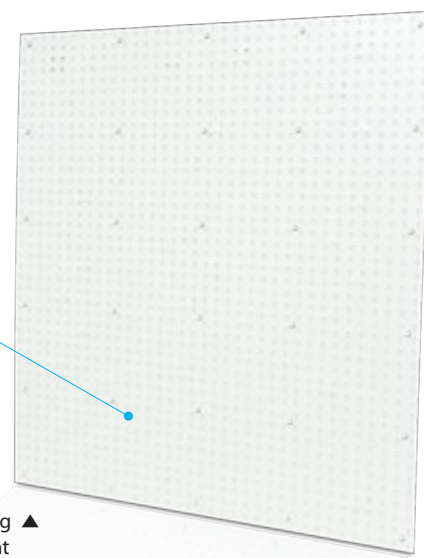
for Full-scale local dimming LCD TV

Mini-LED Backlight in LED-TV

- Genuine HDR through full-scale local dimming
- High brightness 2,000nits and W-OLED compatible CR
- Lens-integrated micro CSP structure
- New solution for flagship 4K / 8K LED TV's



Full-scale local dimming
Mini-LED Backlight ▲

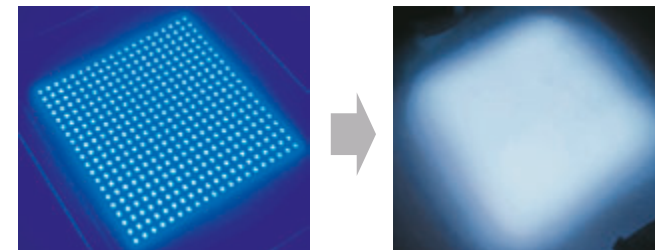


Mini-LED BLU

for HDR and Ultra-silm

- **Ultra Slim Thickness : 0.30T**
for Tablet / Laptop
- Brightness : 2,000 nit ↑
Uniformity : 98% ↑
- Real Local Dimming
(Possible to customize block q'ty)

Ultra Slim Mini-LED BLU Structure



for Tablet ▲



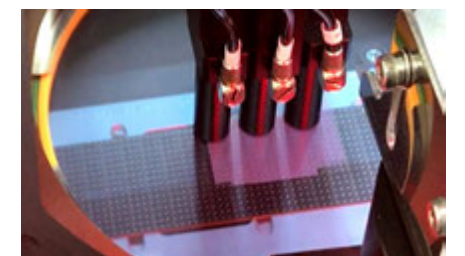
for Laptop ▲

Substrate Solutions

- X-resin substrate
 - Flexible & Slim
 - High thermal pass
 - Minimized warpage
 - Application : Curved & high brightness BLU

LUMENS Mini-LED Capability

- Allowable substrate size : 1200 x 600 mm Max
- Precision : $\pm 20\mu\text{m}$
- Production capacity : 92 M pcs / month



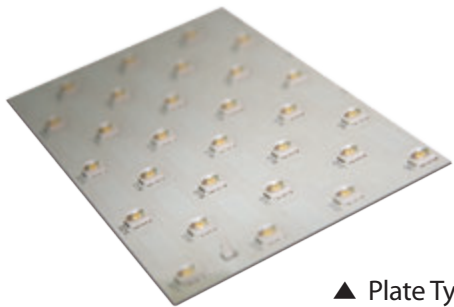
Other BLU Solutions

World's 1st innovation in TV / IT BLU (Backlight Unit)



• World's 1st LED Direct TV applied Lumens LED

Lens type : Efficiency maximize



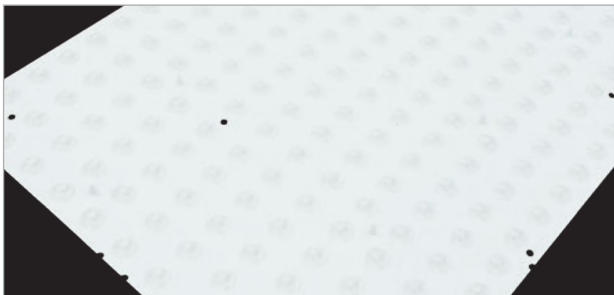
▲ Plate Type



▲ Bar Type

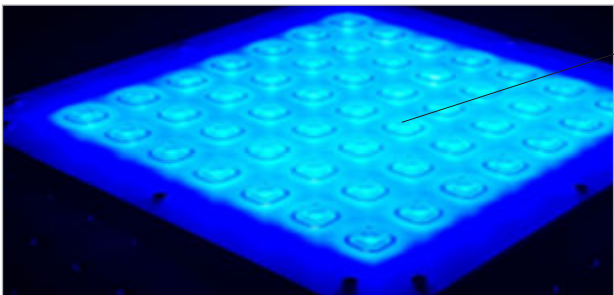
Direct-lit Type for TV (55"~85")

- Conventional (Optical distance : 10mm)



- LED PKG 1,800~3,000 each
- LED to LED pitch : 20~30mm

- New (Optical distance : 3.5mm)

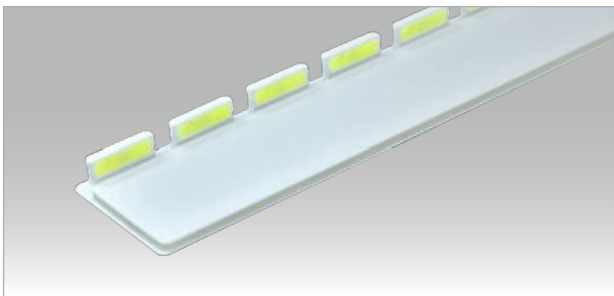


- LED PKG 960 ~ 1400 each
- LED to LED pitch : 30~40mm

• Applied wide angle hybrid Lens
(50% reduction in the number of LED PKG)

Edge-lit Type for TV

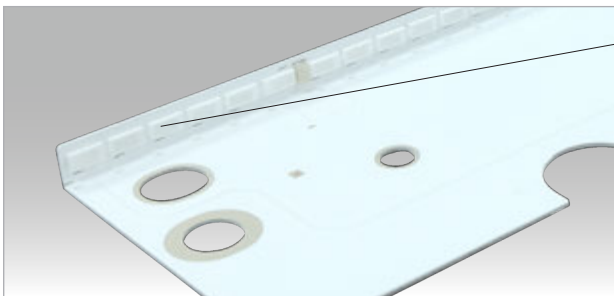
- Gen.2 Narrow



• Side View PKG

※ No heat sink required

- Gen.3 Super Narrow



• CSP with bending PCB

• Ultra slim PKG design +
Bending technology innovation
(can use LGP thinner than 2.0mm)



Smart Head-Lamp

Micro-LED for Automotive



Korea / Headquarter

Lumens Co., Ltd.
12 Wongomae-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Korea (17086)
Tel: 031-8033-2000
Fax: 031-8033-2142

www.lumensleds.com

E-mail : sales01@lumens.co.kr

©Copyright August. 2021 lumens. All rights reserved. Informations may change without notice.

LUMENS

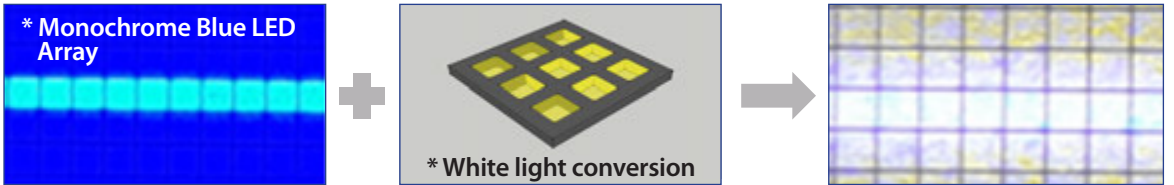
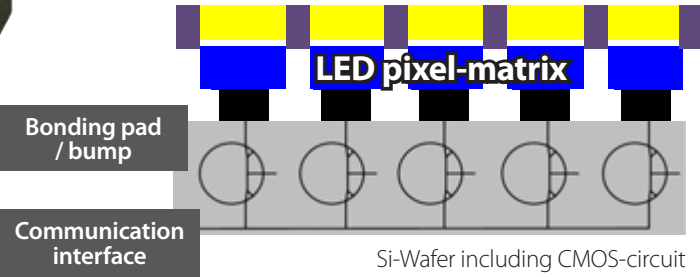
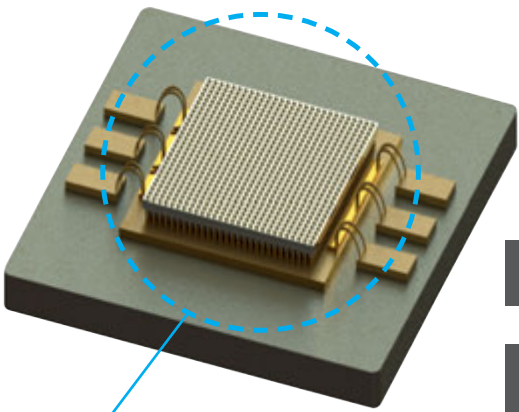


Smart Head-Lamp

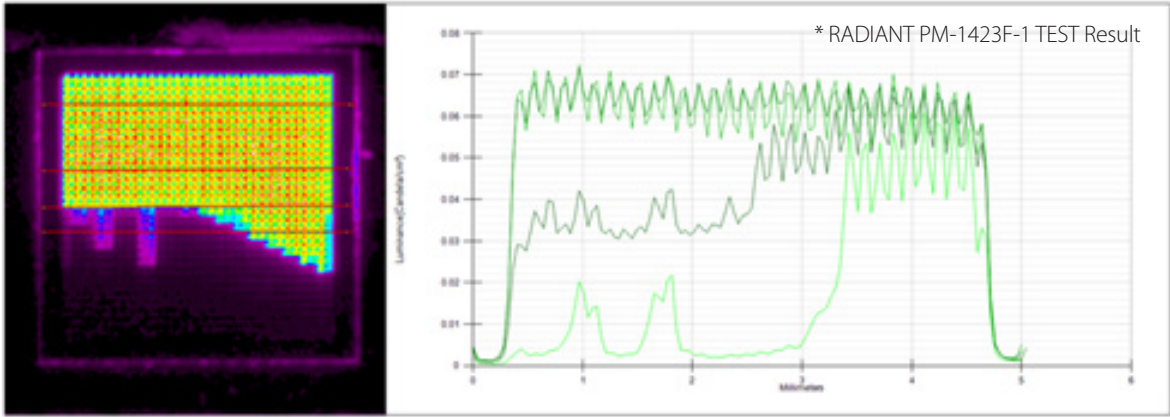
for Automotive

Novel active LED Pixel Matrix (μAFS)

- Integration of Monolithic LED array on CMOS-BP (Back plane) driver IC for compactness
- Robust interconnection between GaN LED array and CMOS-BP for reliability
- ※ LUMENS proprietary High Energy Flip-chip Bonding technology being used

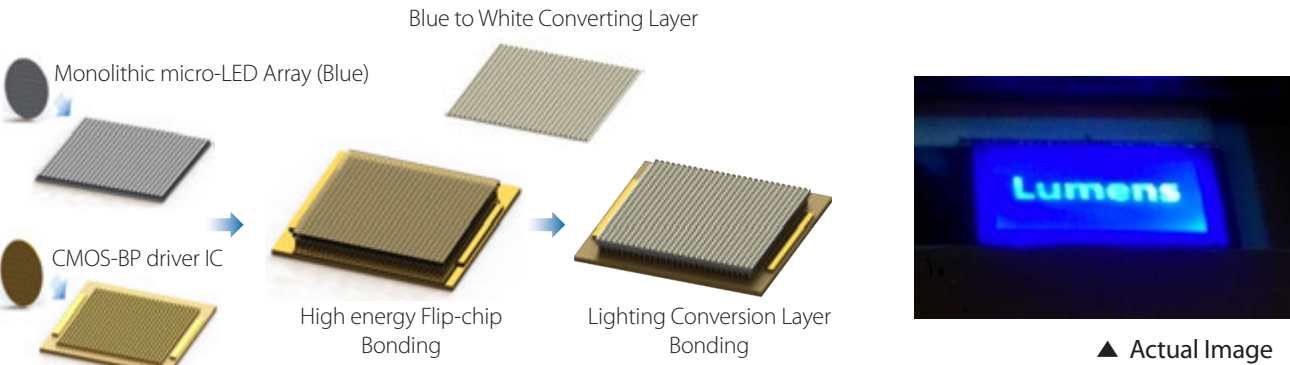


* Color Uniformity TEST : X-talk formation between pixels



Matrix micro-LED Head-Lamp module

Lumens is redefining the automotive use of Micro-LED technologies by collaborating with many OEM's and Tier-1's. From high brightness smart scanning headlamp, to hidden displays underneath the dashboard, to HMI displays, and even to full-screen windshield AR HUD.





Up to 40,000 pixels

The new Matrix micro-LED Head-Lamp module offers about 180 times higher resolution than other comparable solutions on the road that are already delivering glare-free tunnel (dark zone) controlling and beam steering.

Micro-LED
Pixel Lighting
Technology

Pixel Pitch

40µm

Smart Head-Lamp
Line-up

by Lumens Micro-LED Techonlogy

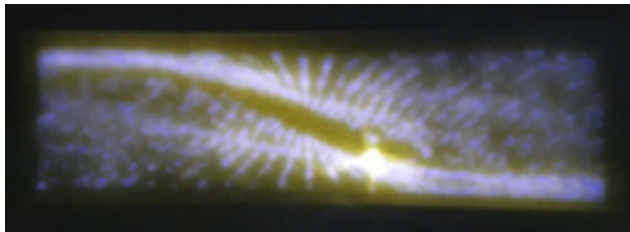


1,024 Pixel



Specifications	
Number of LED's	32 x 32(1:1) = 1,024px
Pixel Pitch	110 µm (*Pixel separation 10µm : Bonding tolerance ±4.0µm)
Illuminating Size	5 x 5 mm
CIE	4,000 ~ 6,000 K
Dimming level	256
Total Flux	4,000 ~ 6,000 lm

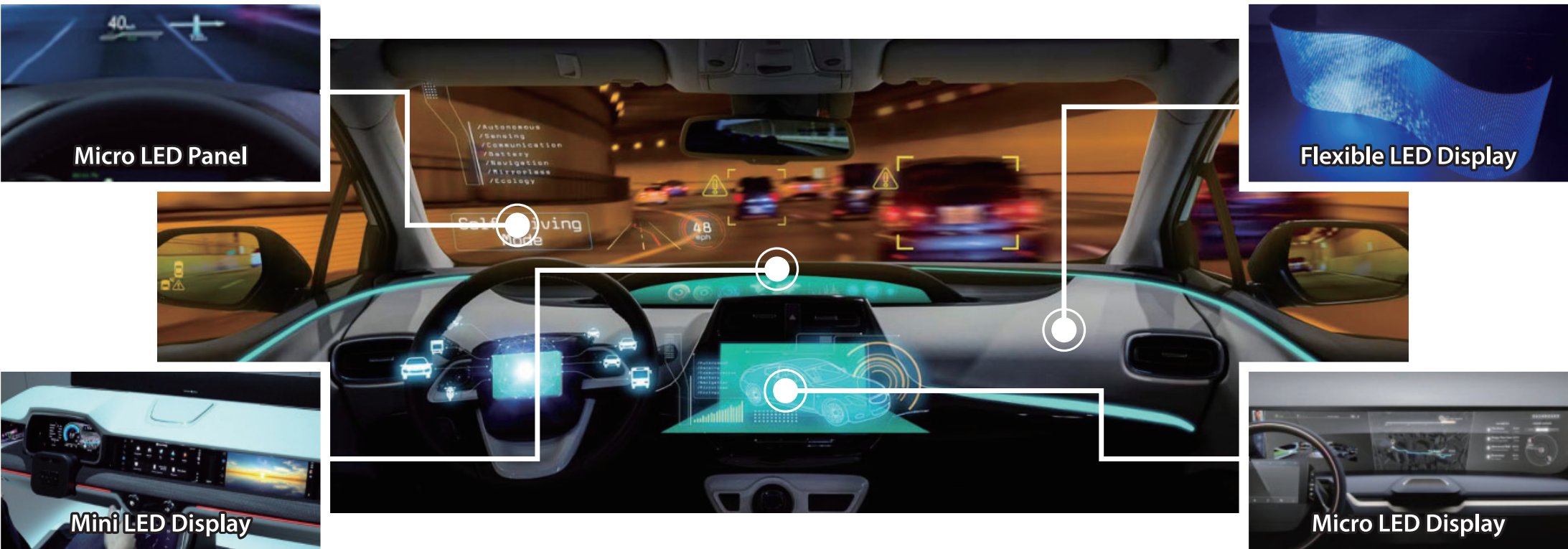
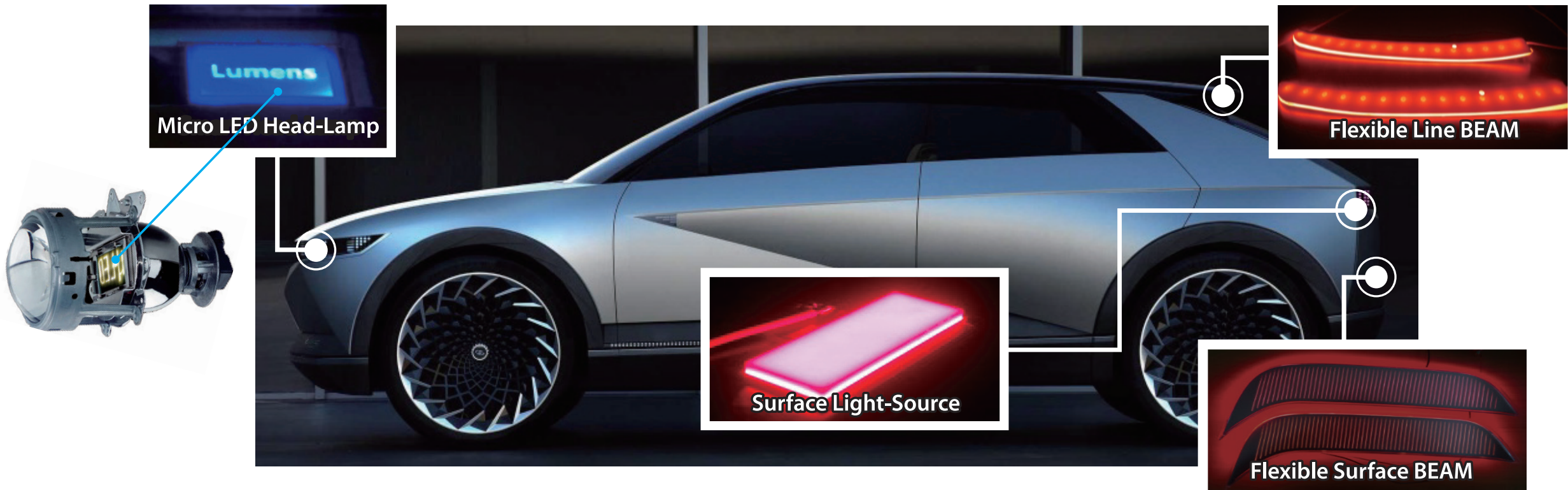
40K Pixel



Specifications	
Number of LED's	400 x 100(4:1) = 40,000px
Pixel Pitch	40 µm (*Pixel separation 5µm : Bonding tolerance ±2.5µm)
Illuminating Size	16 x 4 mm
CIE	4,000 ~ 6,000 K
Dimming level	256
Total Flux	13,000 ~ 15,000 lm

※ Billions of different light variations to adjust for traffic situations

Exterior
Applications



Interior
Applications

Micro LED Panel

with Super Brightness



Korea / Headquarter

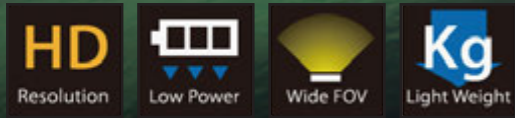
Lumens Co., Ltd.
12 Wongomae-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Korea (17086)
Tel: +82-31-8033-2000
Fax: +82-31-8033-2142

www.lumensleds.com

E-mail : sales01@lumens.co.kr

©Copyright Jan. 2021 lumens. All rights reserved. Informations may change without notice.

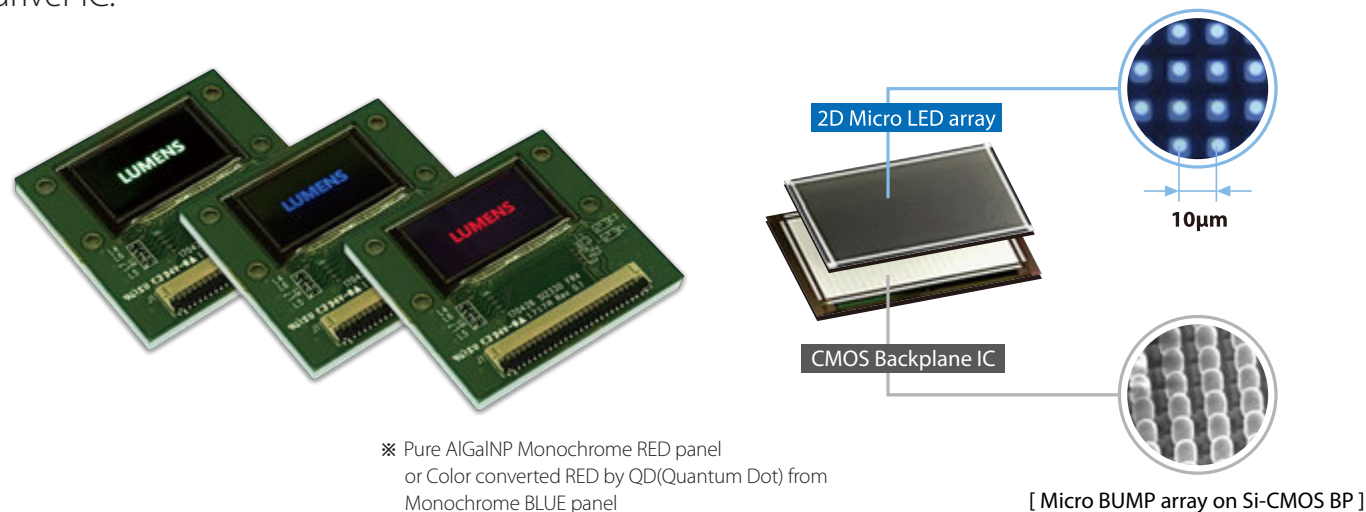
LUMENS



Micro LED Panel

LED Array on Si-CMOS Backplane

World's 1st Bump Bonding Technology for Micro-LED display is based on flip-chip bonding of fine-pixel pitch 2-D array LED chip (1,280 X 720 HD resolution) and its CMOS Backplane driver IC.



World's 1st Bump Bonding Technology

for Micro LED Display

Characteristics of MLP

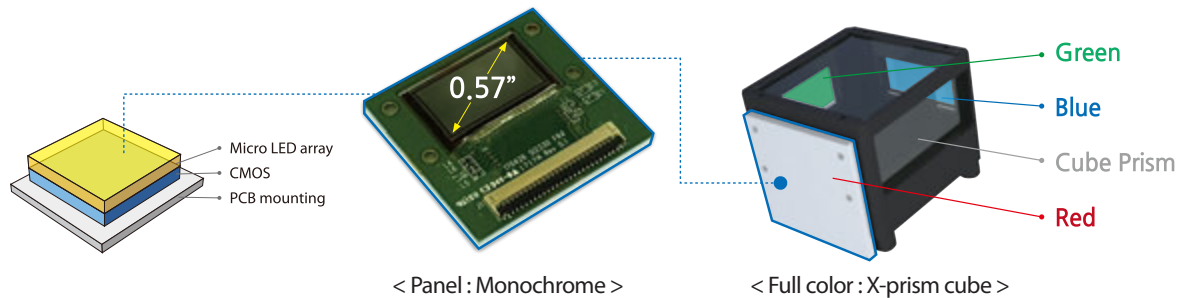
- World's 1st HD Resolution**
- Monochrome 0.57" (HD 1,280 x 720 pixels)
- High Brightness**
- 100,000 nits (Monochrome Green)
- Robust Structure by Bump Bonding**
- Adopted for Machine gun vision scope
- Fine pitch Micro BUMP Technology**
- About 1 million pixels (Pixel pitch 10µm, LED size 8µm)

• Specification

Model	Light Efficiency [%]	Brightness [nit@green]	Contrast Ratio [min.]	Response time	Power Consumption [mW]	Operation Temp. [°C]	Life Time [hrs]
MLP _(mono)	95	100,000	500,000	µs	100	-30 ~ 80	50,000

• General Information

Item	Main Display	Remark
Display Mode	Normally Black, Emissive	
Viewing Direction	Wide View Angle	
Driving Method	Active Matrix	
Input Signals	24Bit RGB I/F	
Outside Dimensions [mm]	24 x 22.5	
Active Area [mm]	12.8 x 7.2	
Number of Pixels [mono color]	1,280 x 720	
Pixel Pitch [µm]	10	2,540 PPI [Mono color]
Weight [g]	3.5	



Speciality
Applications



Automotive

HUD / Smart Matrix Head-Lamp



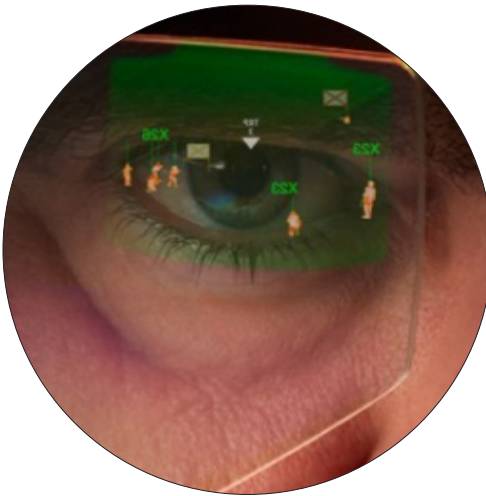
Aerospace & Defence

HMD (Helmet Mounted Display) / Vision Scope



Commercial

AR / VR Glasses



UV LED

Total UV Solution Provider



Korea / Headquarter

Lumens Co., Ltd.

12 Wongomae-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Korea (17086)

Tel: +82-31-8033-2000

Fax: +82-31-8033-2142

www.lumensleds.com

E-mail : sales01@lumens.co.kr

©Copyright Jan. 2021 lumens. All rights reserved. Informations may change without notice.

LUMENS

Powerful Sterilization

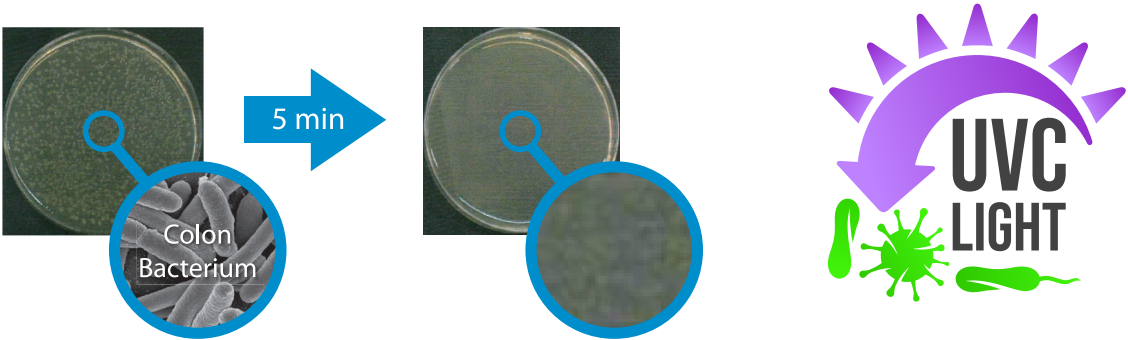
Advantages of UV-C LED

Characteristics of UV-C LED

- Compact Size with AL & Ceramic material**
- AL & Ceramic substrate is available at compact size
- High Reliability (L70@3,000hrs↑)**
- 3,000hrs reliability test passed
- Excellent Thermal resistance (R_{thJ-s})**
- 21°C (Lumens) VS 27°C (A Co.)

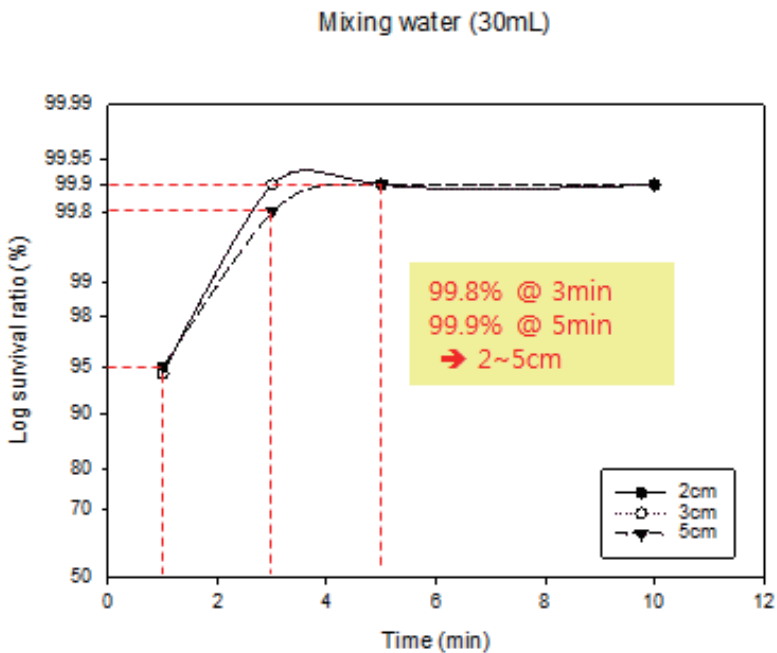
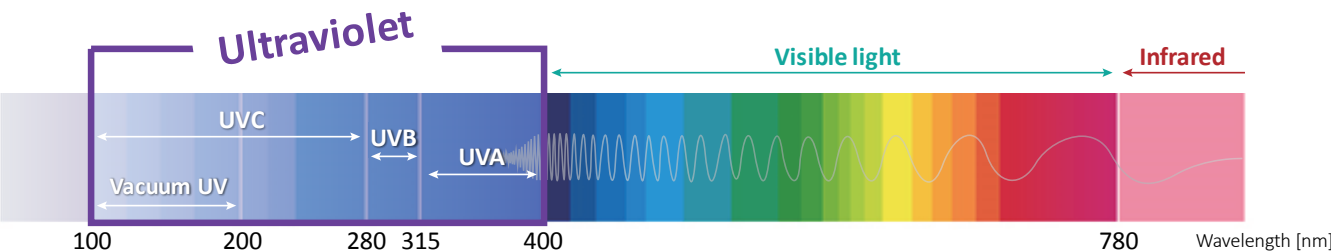
99.9% Sterilization (UV-C LED)

UV-C, with the wavelength of 200 ~ 280 nm, is an effective solution for sterilizing strains of Virus and Bacteria. LUMENS UV-C LED has demonstrated 99.9% sterilization of Bacteria.



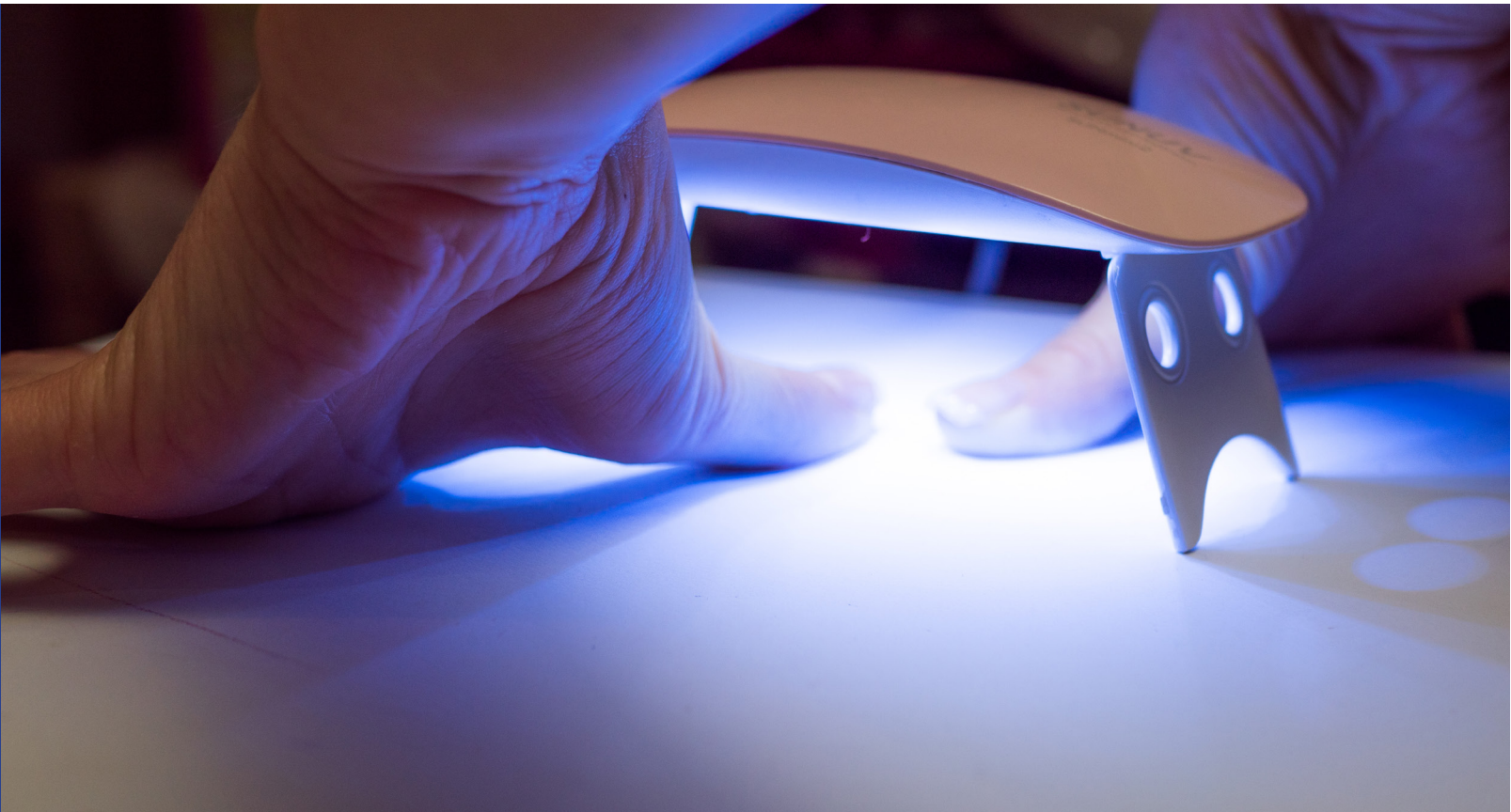
UV LED's Ultraviolet LED

Under a dire Pandemic situation of COVID-19, UV emitting LED's with 0.3 to 2mm sized small chips are taking positions as reliable sterilization solution, replacing UV Mercury Lamps in various sectors, due to improved efficiency and the nature of compactness.



Quick & Safe Curing

Advantages of UV-A LED



Characteristics of UV-A LED

Wavelength
- 365 to 410 nm

Quick & Safe Curing
- through PKG optimization for different UV wavelengths
- Safe curing (No Ozone & less heat)

Eco-friendly
- No hazardous substance as used in Mercury lamps

Powerful Sterilization
Price Competitiveness

Concentrated irradiation
using narrow angle

UVA 365 ~ 410nm

UVC 270 ~ 280nm



Printer



Nail Curing



Counterfeit
detection



Sterilizer



Air Cleaner



Purifier

• Best Performance Effectiveness

- Lumens Flip-Chip base UV LEDs
- Various wavelength range
- Excellent life and performance
- Enhanced thermal dissipation through metal substrate



Applications of UV LEDs

UV LED Product Line-up

Various wavelength & High Reliability

• Package Line-up



UVA PKG

Reduction of curing time

Model name	PKG Size (L x W x T)	Lens	Beam Angle(°)	Wavelength (nm)	Radiant Power (mW)	Forward Current (mA)	Forward Voltage (V)
TL3535LUX39NAxx	3.5 x 3.5 x 2.0	O	115	395~410	67~105	60	3.1~3.5
TM3535LUXxxNAxx	3.5 x 3.5 x 2.5	O	60	395~405	1140~1320	700	3.4~3.7
				380~390	1080~1260	700	3.4~3.7
				365~375	1020~1200	700	3.5~3.8

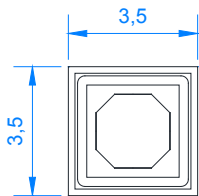


UVC PKG

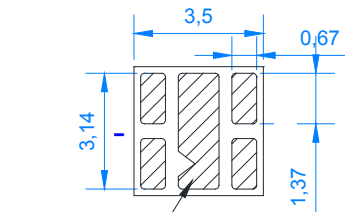
Powerful Sterilization

Model name	PKG Size (L x W x T)	Lens	Beam Angle(°)	Wavelength (nm)	Radiant Power (mW)	Forward Current (mA)	Forward Voltage (V)
TL3535LUX27NAxx	3.5 x 3.5 x 1.55	-	115	270~280	3~5	40	5.5~6.5
TM3535LUX27NAxx	3.5 x 3.5 x 1.55	-	115	270~280	10~15	100	6.0~7.0

► Outline Dimensions



Top View



Cathode mark
Bottom View



Side View

• Module Line-up

AC-ALL™ provides UV product designers and manufacturers with an excellent Driverless module / engine solution. It brings the best design flexibility to you as it was designed to run on AC current. Lumens AC UVC module of the AC-ALL™ series is especially the perfect solution in linear / areal types of sterilizer applications.

※ **Suitable for Custom design**

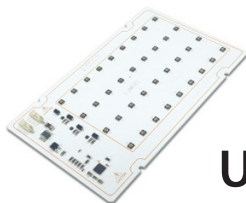
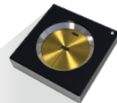
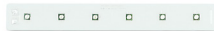


UVC Linear-on



Model name	PKG Size (L x W x T)	Watt	Beam Angle(°)	Wavelength (nm)	Radiant Power (mW)	Forward Current (mA)	Forward Voltage (V)
TM3535BUX27NAxx	280 x 20 x 6.6	6~10	115	270~280	25~50	40	DC / 25V AC / 220V

※ DC or AC Available



UVC Tile-block



Model name	PKG Size (L x W x T)	Watt	Beam Angle(°)	Wavelength (nm)	Radiant Power (mW)	Forward Current (mA)	Forward Voltage (V)
TM3535TUX27NAxx	160 x 100 x 6.6	6~10	115	270~280	40~80	40	DC / 25V AC / 220V

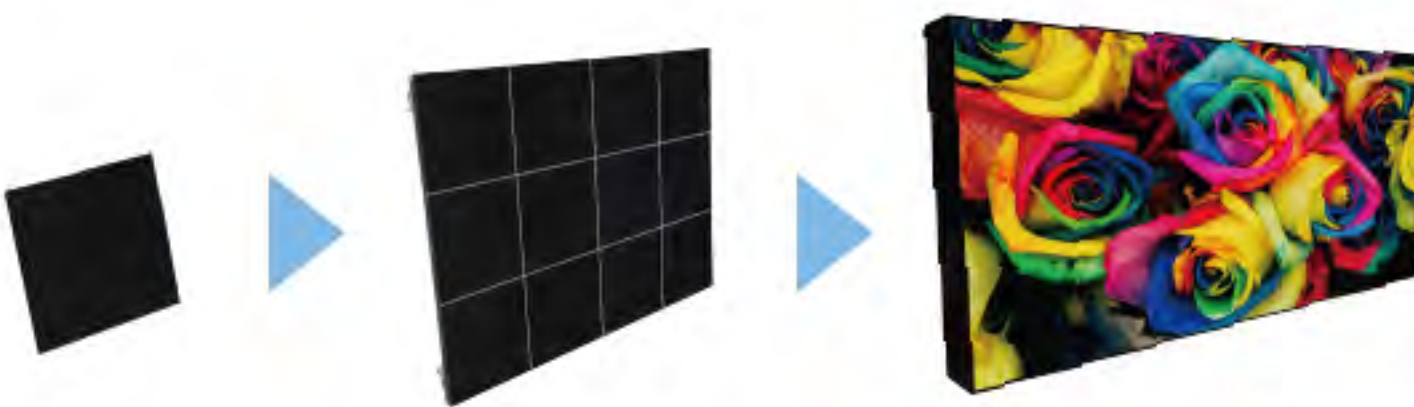
※ DC or AC Available



UVC Waterproof

Model name	PKG Size (L x W)	Watt	Beam Angle(°)	Wavelength (nm)	Radiant Power (mW)	Forward Current (mA)	Forward Voltage (V)
TL3535WUX27NAxx	ø37.1	0.2	115	270~280	3~5	40	5.5~6.5
TM3535WUX27NAxx	ø37.1	0.6	115	270~280	10~15	100	5.5~6.5

► Product Line-up



COM (Chip on Module)

• Module

Model	Pixel pitch [mm]	Resolution [px]	Brightness [nits, typ.]	Demension [mm]	Weight [kg]	Contrast Ratio [min.]
M08	0.8	120 x 120 (14,440)	2,000	96 x 96	0.08	100,000 : 1
M16	1.6	120 x 60 (7,200)	1,500	192 x 96	0.13	
M20	2.0	120 x 60 (7,200)	1,000	240 x 120	0.2	

• Unit

Model	Pixel pitch [mm]	Resolution [px]	Brightness [nits, typ.]	Dimension [mm] (Screen Size)	Weight [kg]	Contrast Ratio [min.]
U08 (12 Modules)	0.8	480 x 360 (172,800)	2,000	384 x 288 (18.9")	3.2	100,000 : 1
U16 (6 Modules)	1.6	240 x 180 (43,200)	1,500	384 x 288 (18.9")	2.9	

• Set ※ Suitable for Custom design

Model	Pixel pitch [mm]	Resolution [px]	Brightness [nits, typ.]	Dimension [mm] (Screen Size)	Weight [kg]	Contrast Ratio [min.]
FHD-S08 (12 Units)	0.8	1,920 x 1,080 (2,073,600)	2,000	1,392 x 864 (70")	38	100,000 : 1
UHD-S08 (48 Units)	0.8	3,840 x 2,160 (8,294,400)	2,000	2,784 x 1,728 (139")	154	
FHD-S16 (48 Units)	1.6	1,920 x 1,080 (2,073,600)	1,500	2,784 x 1,728 (139")	139	

• Module

Model	Pixel pitch [mm]	Resolution [px]	Brightness [nits, typ.]	Demension [mm]	Weight [kg]	Contrast Ratio [min.]
M07	0.78125	192 x 216 (41,472)	1,200	150 x 168.75	0.5	100,000 : 1
M09	0.9375	160 x 180 (28,800)	1,000			
M12	1.25	120 x 135 (16,200)	800			

• Unit

Model	Pixel pitch [mm]	Resolution [px]	Brightness [nits, typ.]	Dimension [mm] (Screen Size)	Weight [kg]	Contrast Ratio [min.]
U07 (8 Modules)	0.78125	768 x 432 (331,776)	1,200	600 x 337.5 (27.1")	7	100,000 : 1
M09 (8 Modules)	0.9375	640 x 360 (230,400)	1,000			
M12 (8 Modules)	1.25	480 x 270 (129,600)	800			

• Set ※ Suitable for Custom design

Model	Pixel pitch [mm]	Resolution [px]	Brightness [nits, typ.]	Dimension [mm] (Screen Size)	Weight [kg]	Contrast Ratio [min.]
UHD-S07 (25 Units)	0.78125	3,840 x 2,160 (8,294,400)	1,200	3,000 x 1,687 (136")	180	100,000 : 1
UHD-S09 (36 Units)	0.9375	3,840 x 2,160 (8,294,400)	1,000	3,600 x 2,025 (163")	257	
UHD-S12 (64 Units)	1.25	3,840 x 2,160 (8,294,400)	800	4,800 x 2,700 (217")	453	

POM (Package on Module)

Mini-LED Display MLD

Modular expansion
to any sizes



KOREA / Headquarter
Lumens Co.,Ltd.
12, Wongomae-ro, Giheung-gu, Yongin-si,
Gyeonggi-do, Korea(17086)
Tel : +82-31-8033-2000
Fax : +82-31-8033-2142

www.lumensleds.com
E-mail : sales01@lumens.co.kr
©Copyright Aug. 2020 lumens. All rights reserved. Informations may change without notice.

LUMENS MLD as PID

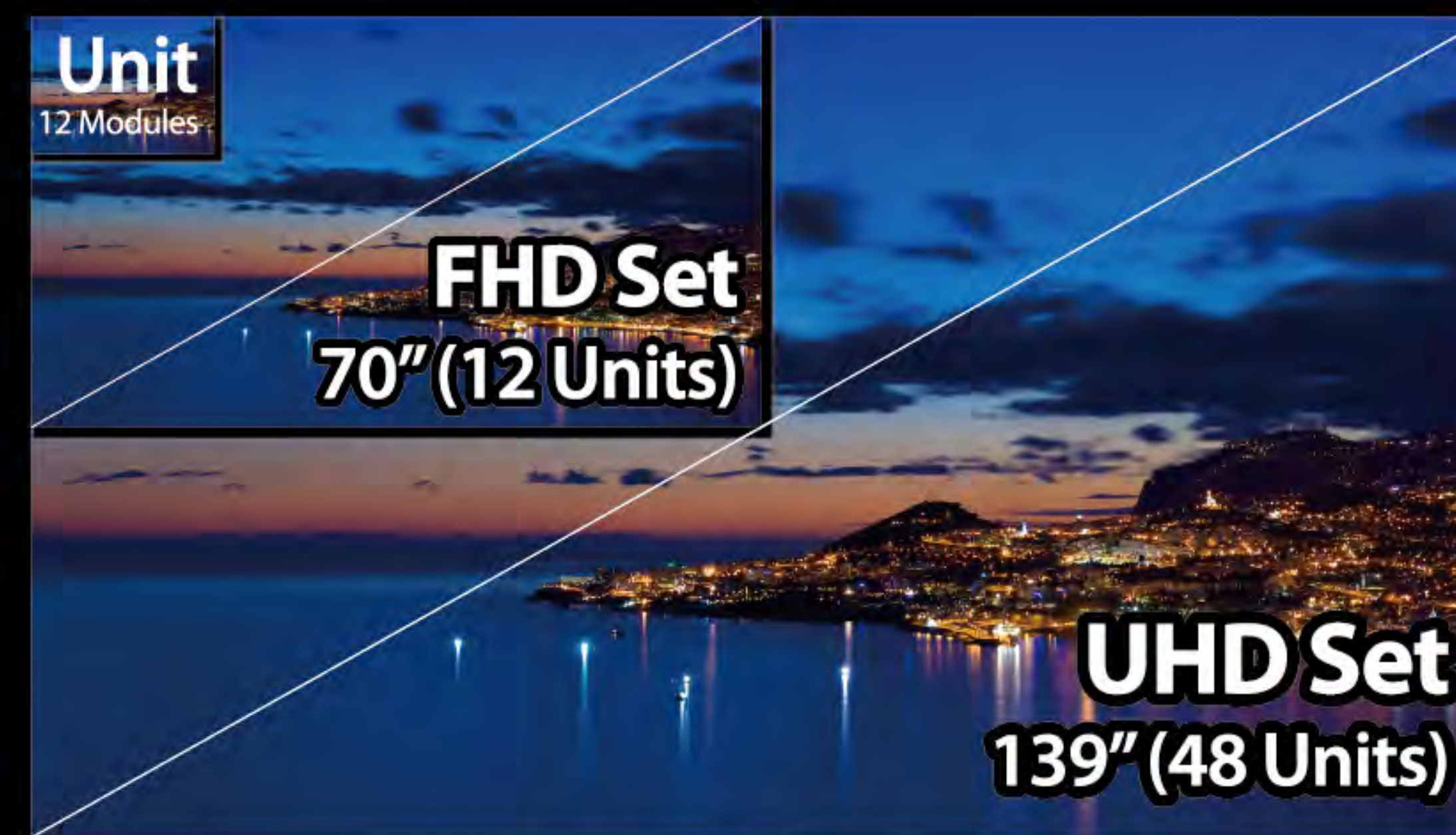
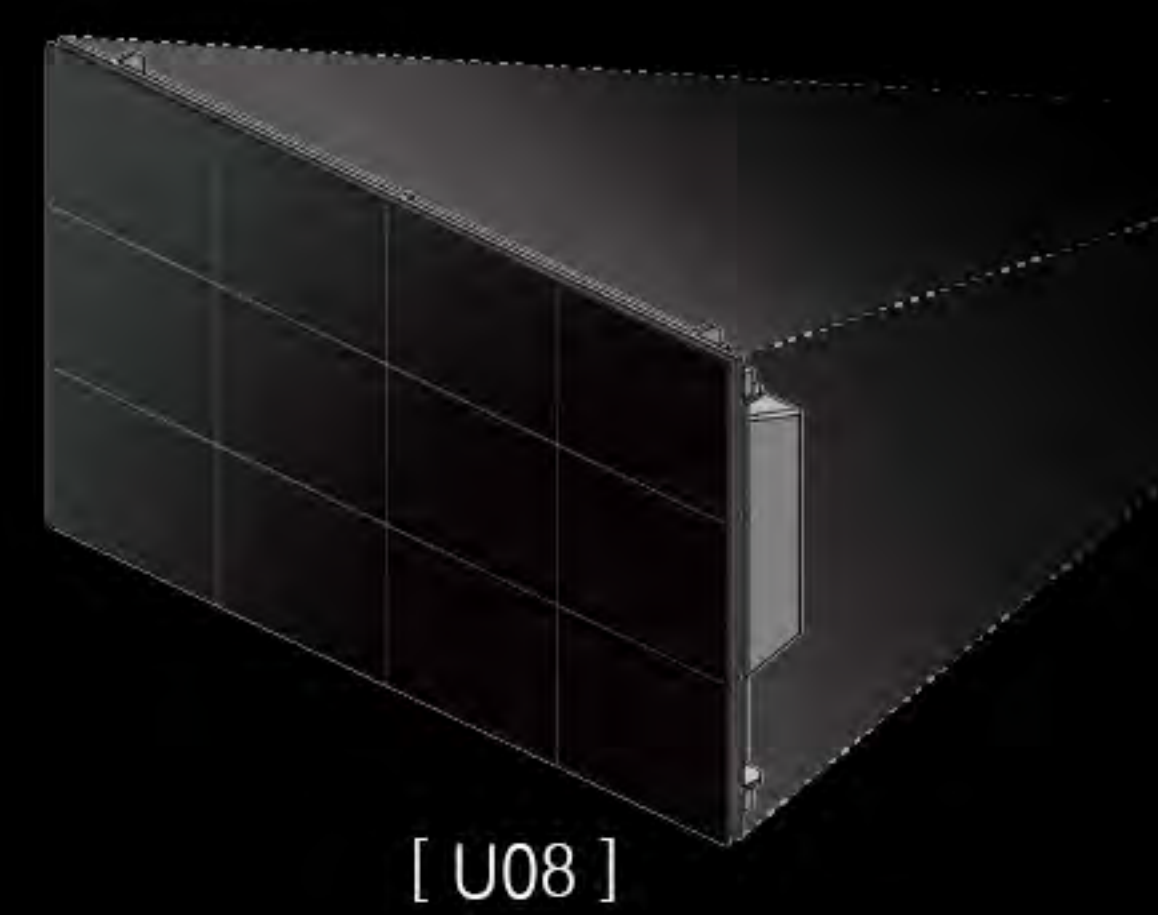
LUMENS delivers mini-LED displays both in POM (PKG on Module) and COM (Chip on Module) forms. Seamless expansion to any sizes, as an array, is the main benefit of using MLD as display solution. Other than the tiled PID applications like Videowall, LUMENS proprietary flip-chip solution (COM) is being adopted for various Automotive uses where reliability and brightness are the first priorities.



COM, Best solution for Automotive

COM type MLD, with its superiority to POM type, is believed to be best fit for Automotive applications. HMI (Human Machine Interface) displays for Autonomous driving vehicles require reliability (Flip-chip bonding vs. wire bonding) to endure extreme road conditions of shocks & vibrations and high brightness (> 3,000nit) to fight direct sunlight.

Scalability



< Pixel Pitch : 0.8 mm >

Applications



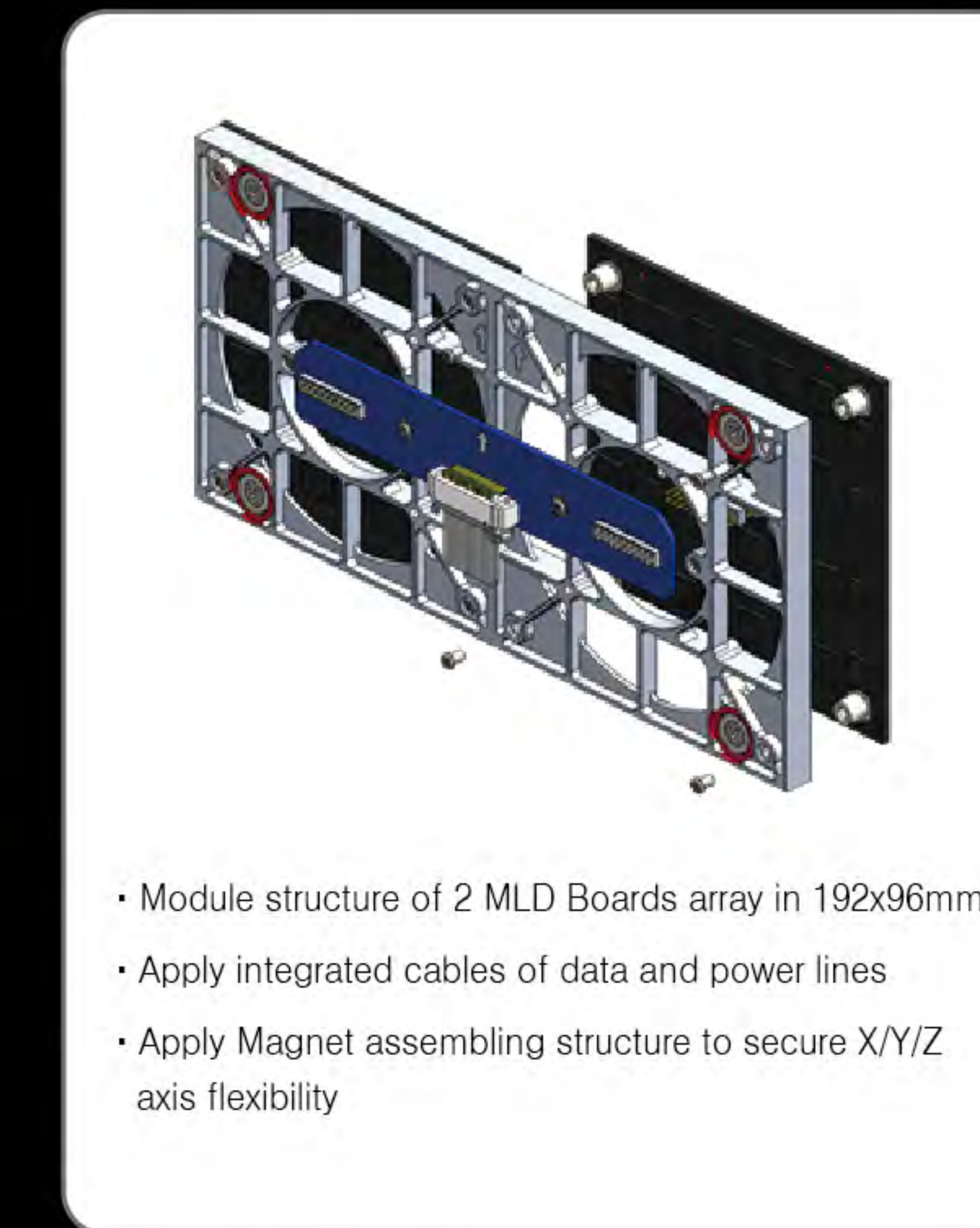
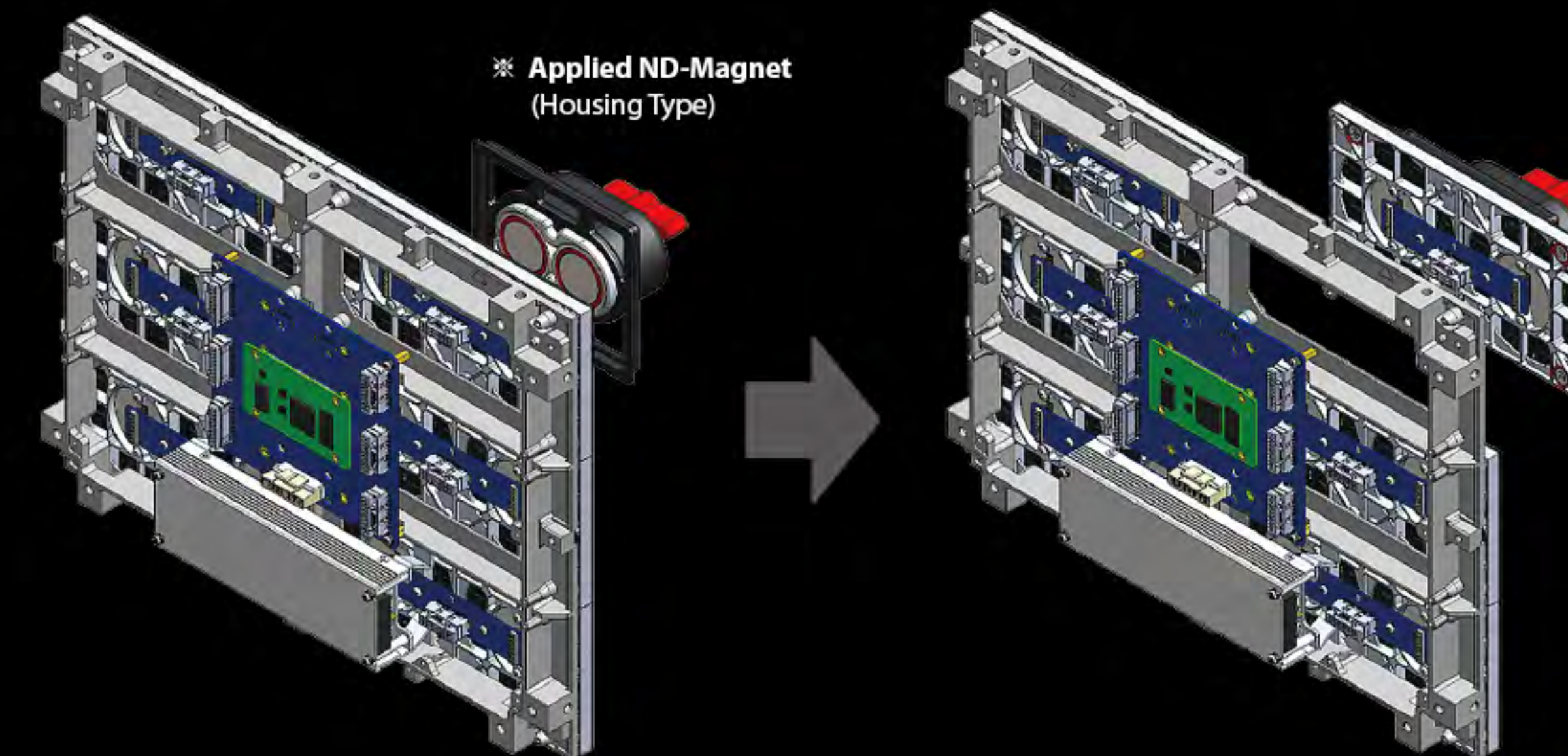
Broadcasting Videowall Conference Room Automotive Exterior Automotive Interior



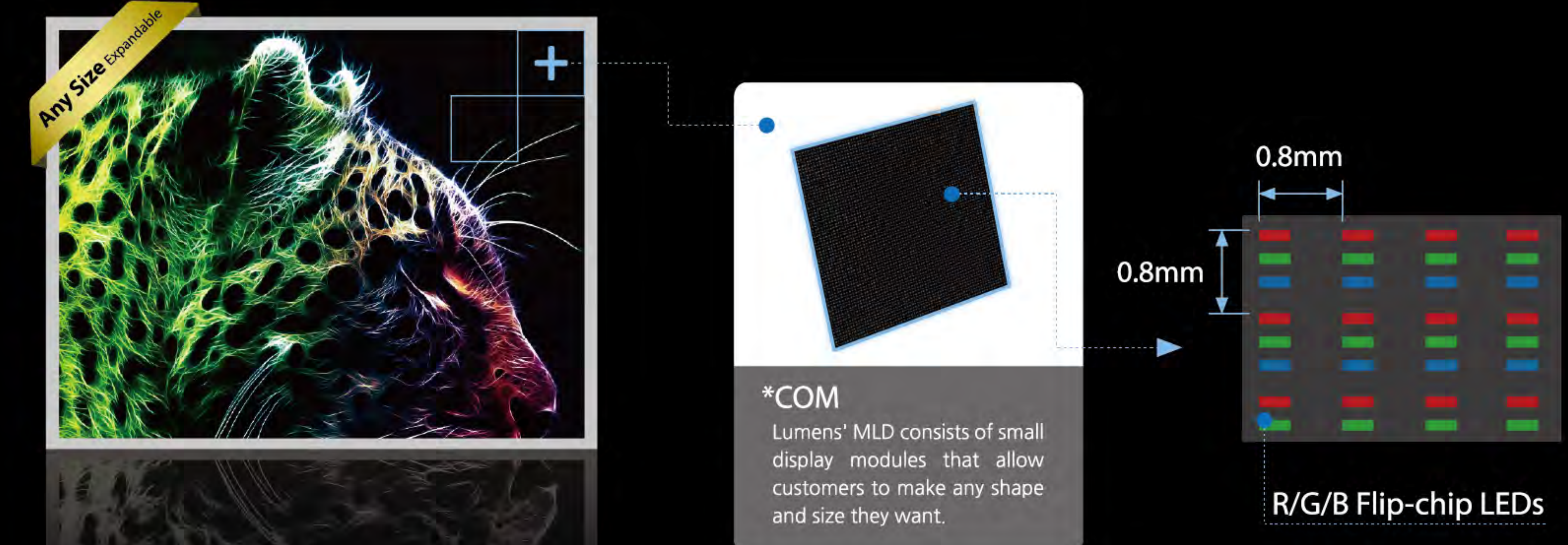
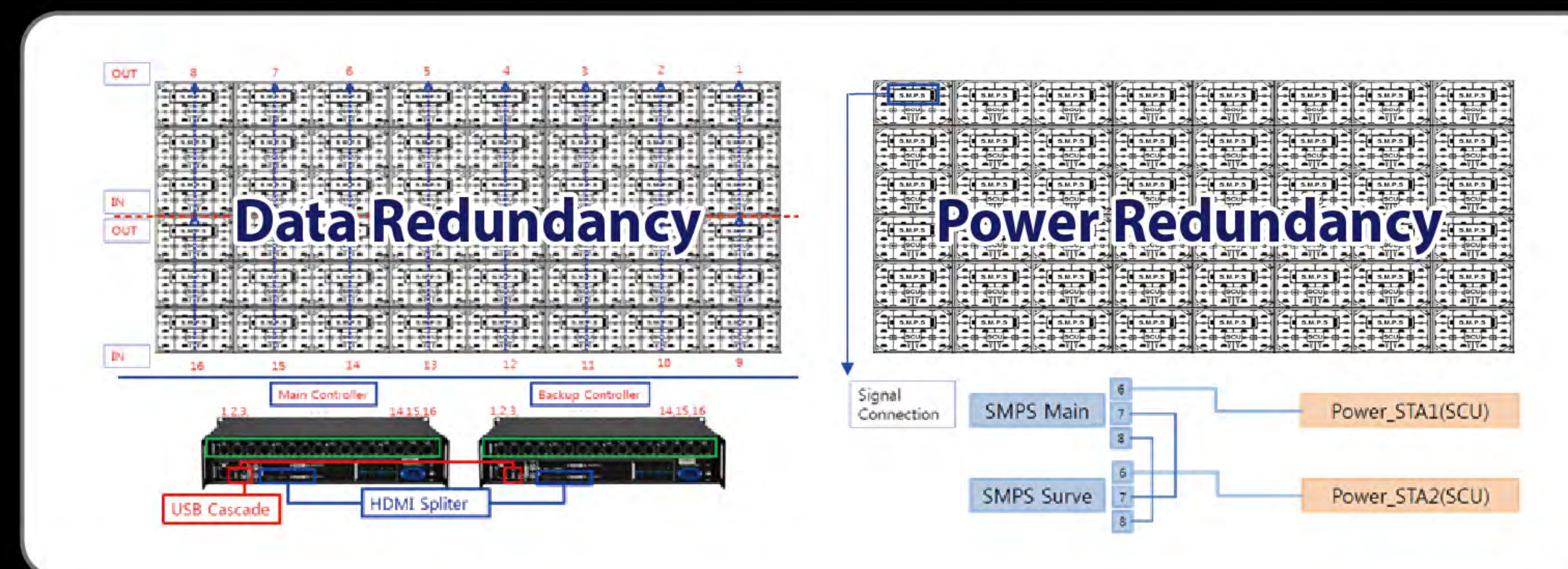
Airport, Terminal Theater Stadium Casino, Game Hotel, Mall

Front Installation & Maintenance

It is a specialized front serviceable solution of Lumens that minimizes seam, secures uniformity (securing X/Y/Z axis flexibility), and improves constructivity (integrated cable system).



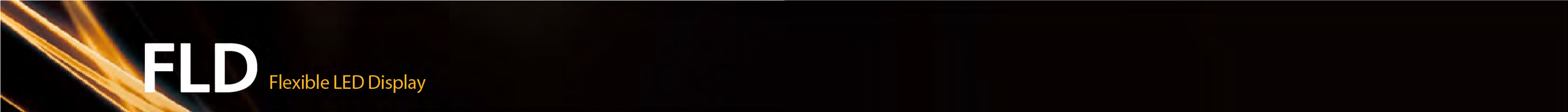
Data, Power redundancy solution at SET level (Optional)



High Reliability, Super Brightness

- Fine Pixel Pitch Technology
- No limited size, Irregular Shapes
- Simple Structure
- Long Life Time : 100,000 hrs.





► Specification

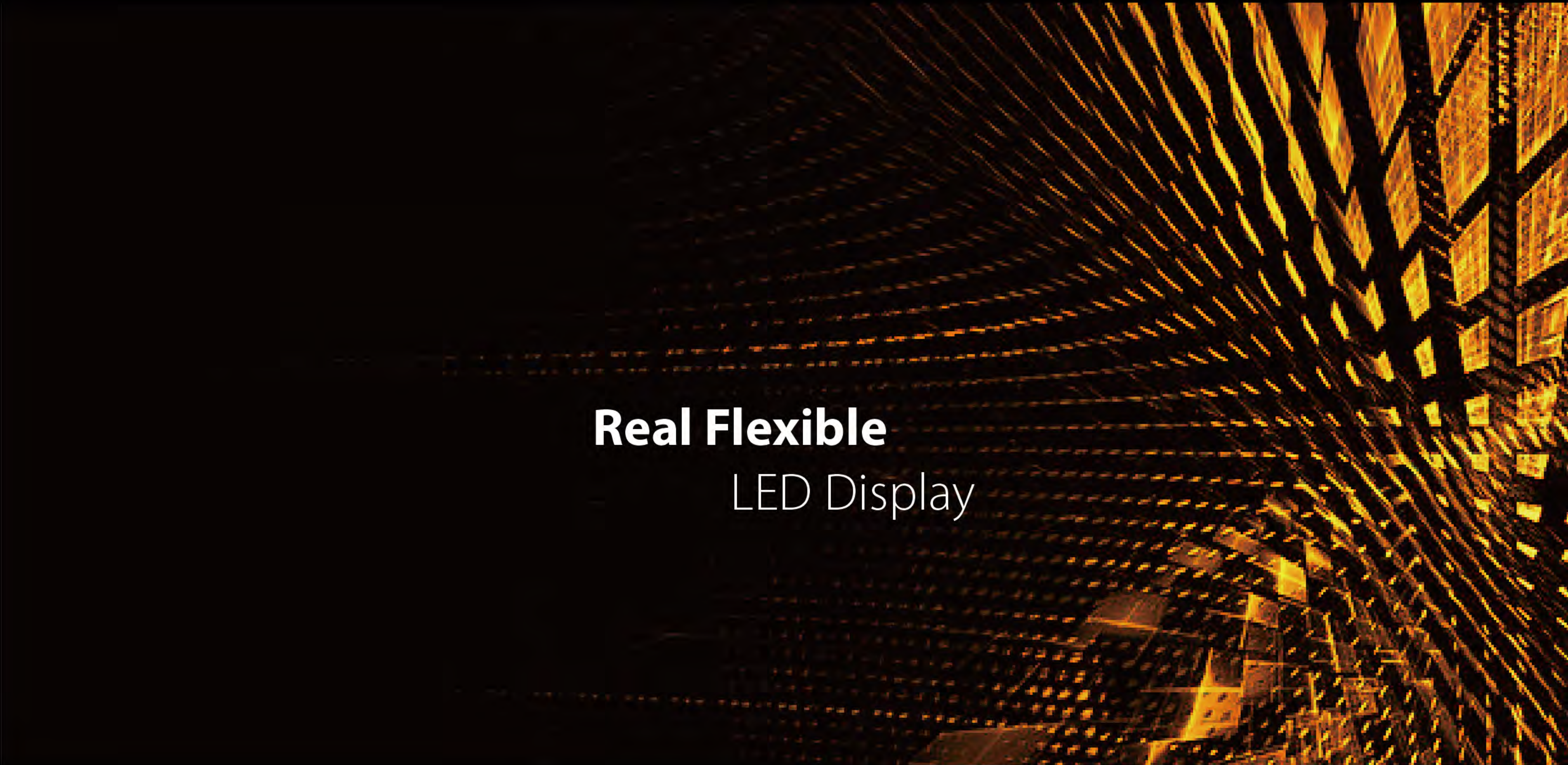
General Features

Item		Description
Structure (per Module)	Dot Pixel Pitch	2.5 mm
	Size (W x H)	480 mm x 160 mm
	Number of Dots	12,288 ea (192 X 64)
	LED	R:1, G:1, B:1
Display Color		Full Color
Weight		350 g
Application		Indoor
IP		IP 20

Unit Spec.

Item	Specifications
Product Name	FLD (Flexible LED Display) Unit : FLD-P2.5
Pixel Pitch	2.5 mm
LED Type	LED RGB PKG 1.5 X 1.5 mm
Resolution	192 X 64
Unit Size (W x H x D)	480 X 160 X 3 mm
Power Consumption, Maximum per uint (without controller)	20W
Power Consumption, Typical per uint (without controller)	12W
Line Voltage	100~240VAC, 50/60Hz
Brightness Typ. (cd/m²)	1,000
Brightness Max. (cd/m²)	2,000
Unit Weight (Display only)	350g
Banding Radius	r > 300 mm
Brightness Uniformity	97%
Color Uniformity	97%
LED Refresh Rate	1,920 Hz
Color Temperature, Adjustable (K)	8000-15000 (Adjustable)
Viewing Angle, Horizontal	120°
Viewing Angle, Vertical	120°
Video Inputs	HDMI
Video Input Resolution	1920 x 1080 @ 60Hz (per controller)
Control Input Type	USB-C 2.0
Gray Scale Processing, Maximum	16-bit
Service Access	Front & Rear
LED Lifetime, Typical	100,000 hours

Flexible LED Display FLD



Real Flexible LED Display



KOREA / Headquarter
Lumens Co.,Ltd.
12, Wongomae-ro, Giheung-gu, Yongin-si,
Gyeonggi-do, Korea(17086)
Tel : 031-8033-2000
Fax : 031-8033-2142

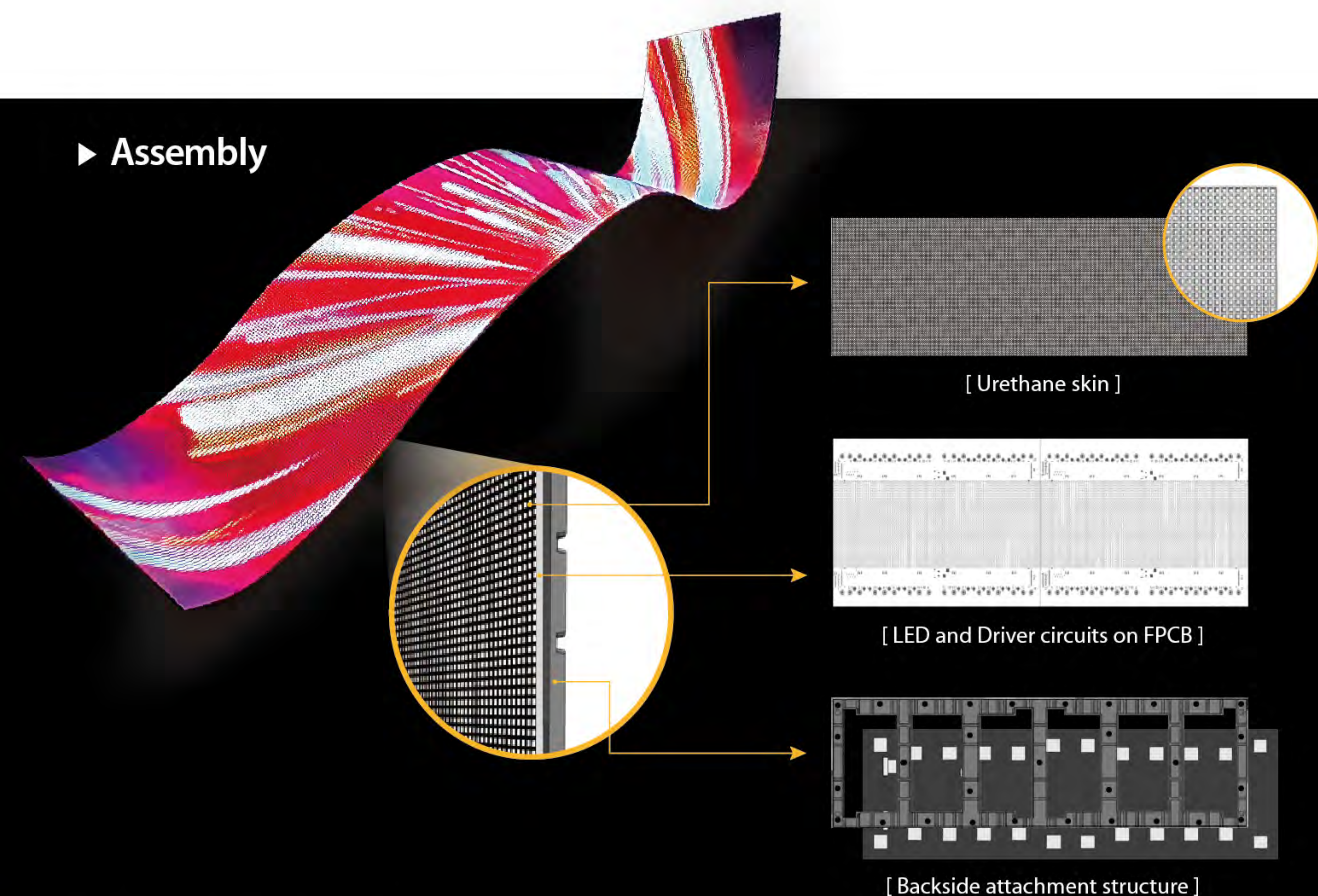
www.lumensleds.com
E-mail : sales01@lumens.co.kr
©Copyright Aug. 2020 lumens. All rights reserved. Informations may change without notice.

LUMENS
Leading the LED Revolution

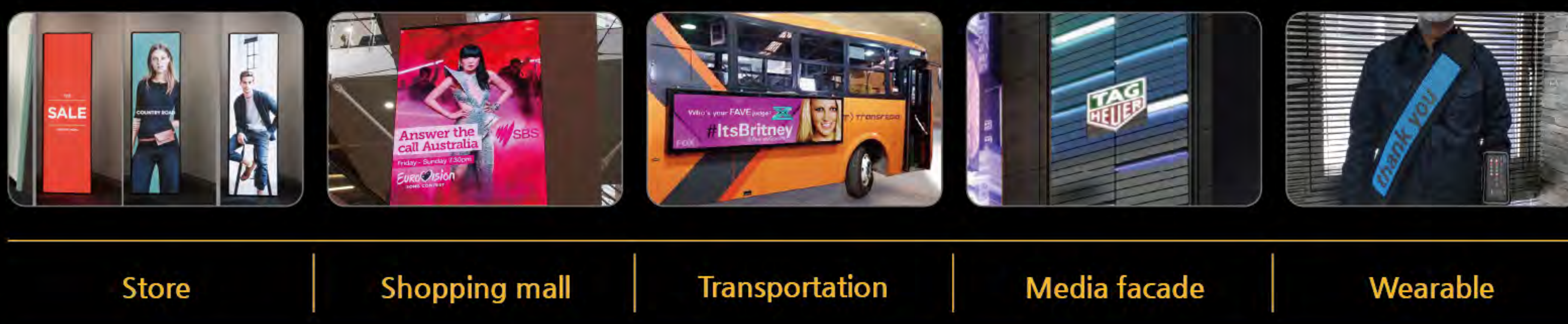
LUMENS FLD

LUMENS stands atop with its **flexible LED display**, while competitors claim FLEXIBILITY using bendable FR-4 substrate. Based on a real flexible PCB, LUMENS' FLD delivers thin(**less than 3mm**) and light(**less than 0.5Kg**) module with ultimate bending capability (**300mm curvature**). Its urethane skin may keep pedestrians from getting injured at a potential event of high altitude drop of the display unit.

Assembly



Applications



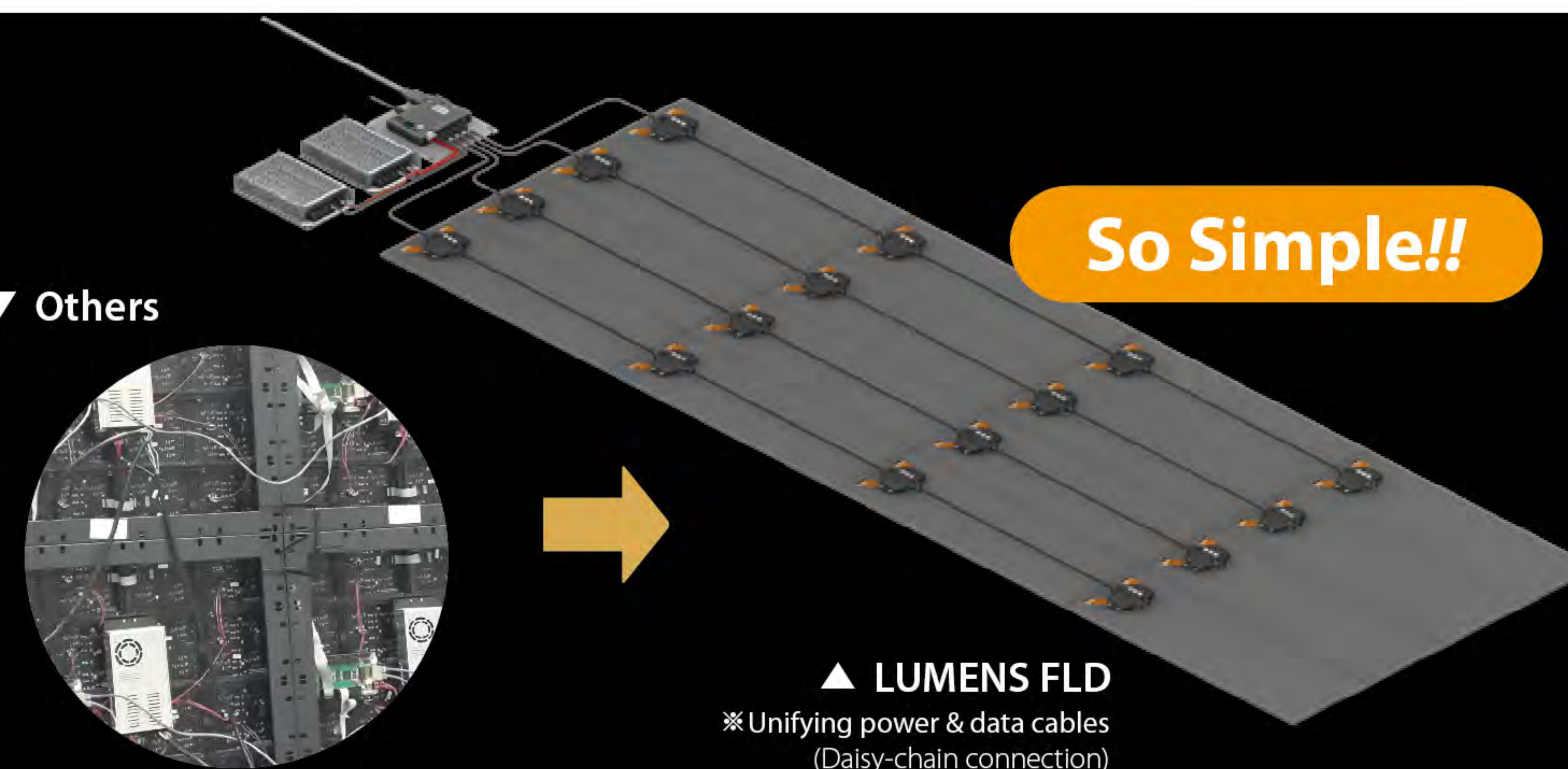
Easy Installation

LUMENS has removed the hassle of installation through its renovated expansion solution. Power and signal from SMPS and SCU (Sub-control Unit) are being cascaded by USB-C cable from one FLD module to another. This **daisy-chain connection** comes along with just-throw-to-install magnet attachment on any metal surface.

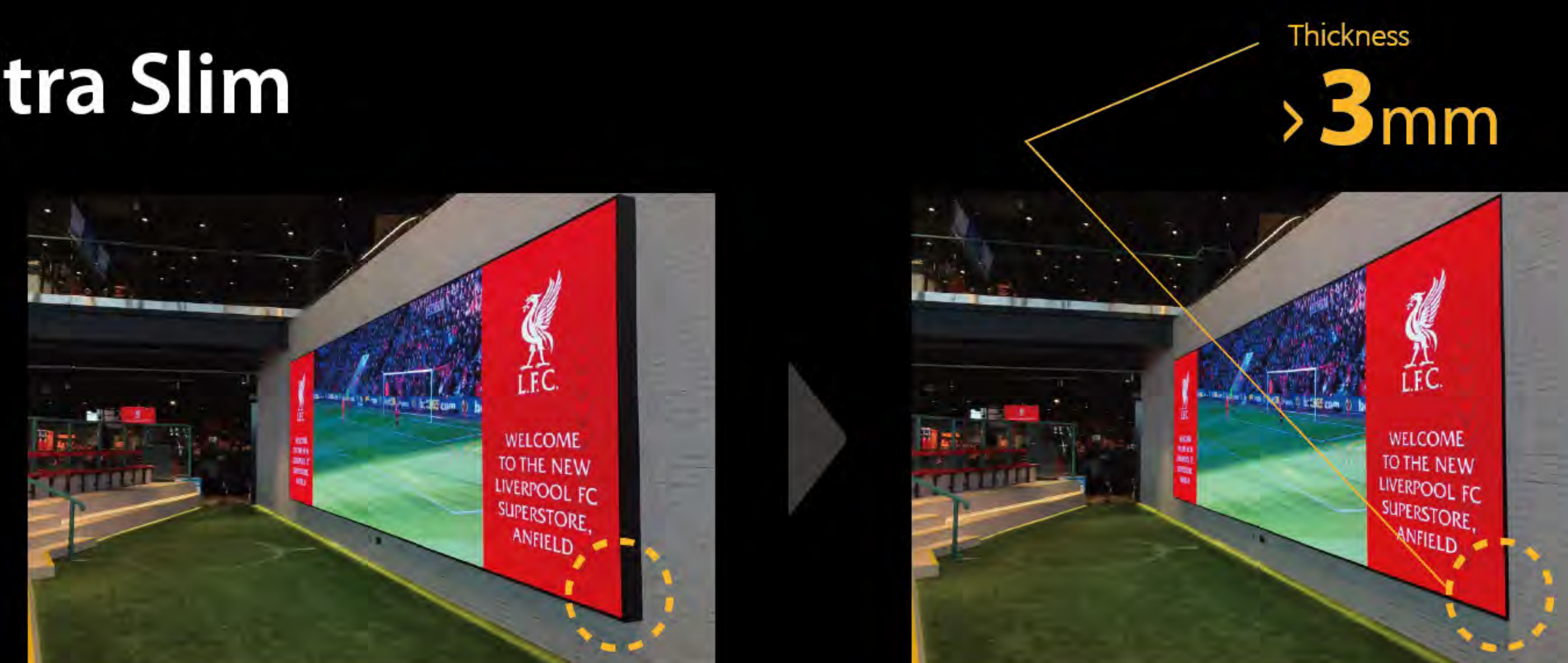


▲ Media Robot wearing FLD

Others



Ultra Slim



The FLD array unit complies with ADA (The American with Disabilities Act) requirement by clearing prorsion issue in any wall-mounted displays. No huge construction for service space as in other display cases leads to a huge reduction in TCO(Total Cost of Ownership) as well.

Characteristics of FLD

Slim Design

Product thickness is below 3mm

Light Weight

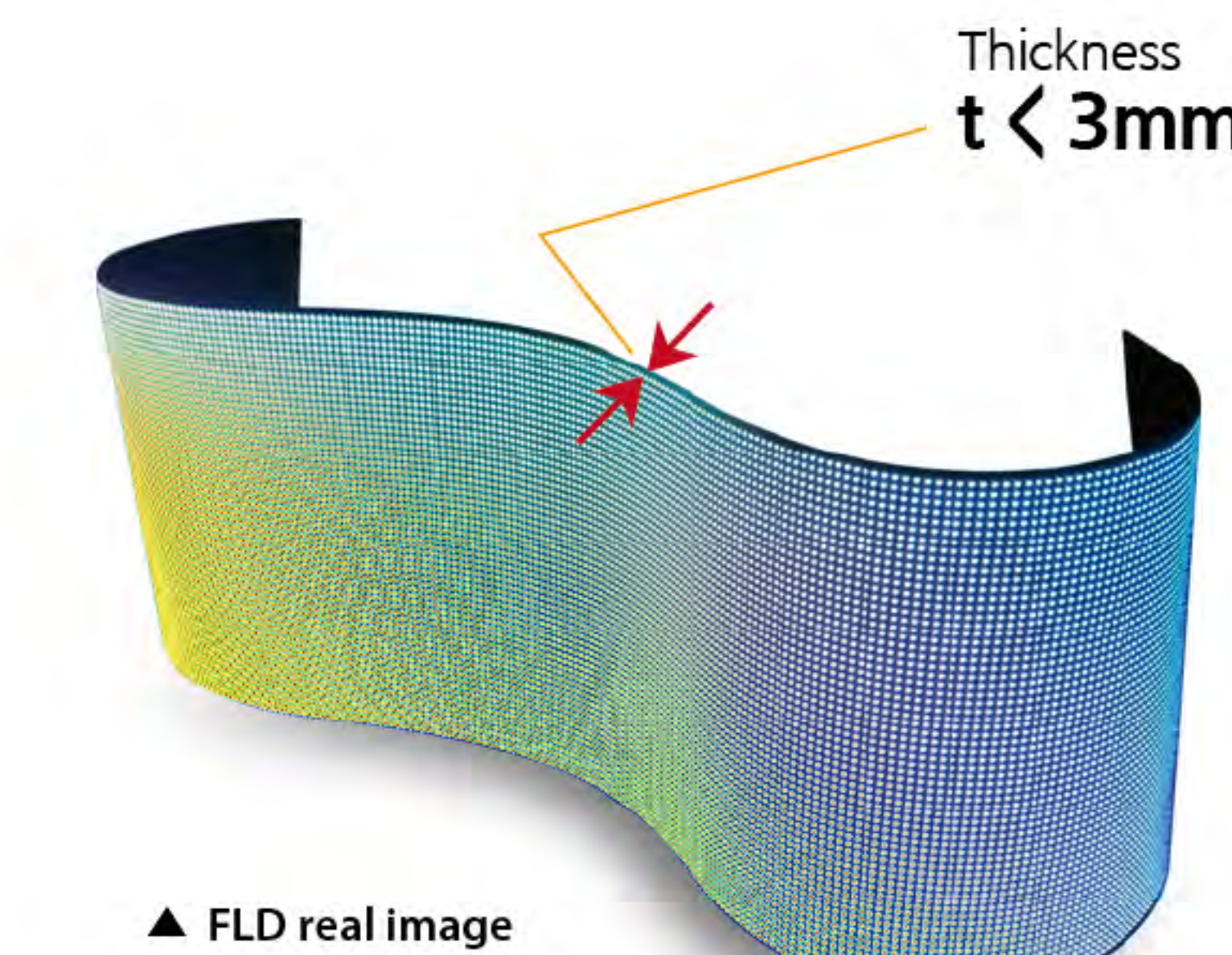
Module weight below 0.5kg

Real Flexible LED Display

Provides high degree of freedom in both in-fold and out-fold capabilities

Easy Installation

Simple wiring connection (Unifying power & data cables)



▲ FLD real image

Amazing Flexibility



▲ Others



▲ LUMENS FLD

Reliability

Test Item	Test Conditions	Remark
Temperature Operation	-30 ~ 70 °C, 240 Hr	
High Temperature and High Humidity Operation	60 °C, 90 %, 240 Hr	
Temperature Storage	-30 ~ 80 °C, 240 Hr	
Thermal Shock	-30 °C, 85 °C (each 30 Min), 300 cycle	
Vibration Test (non-operating)	X, Y, Z @ Random 10 ~ 35 Hz for 30 min	(Packaged in a box)
Drop Test	70 cm / 1 Corner / 3 Edge / 6 Surface	(Packaged in a box)
Electrostatic withstanding voltage (non-operating)	Air : 8KV	EN61000-4-2:2009 For CE Electrostatic Discharge
	Contact : 4KV	